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CONTENTS

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Editorial Note

In the last two decades India has experienced number of changes in the business and industrial environment. The New Reforms of 1991 has been able to provide a dynamic business environment that was lacking in the first five decades after independents. Accordingly new and hitherto unobserved business opportunities have emerged for budding entrepreneurs. The traditional and conventional business lines have taken a back seat. Sum of these emerging areas of business are outsourcing, consultancy, hospitality, tourism and others.

The Food Technology, Management and Food Services Sector also are under this important emerging area. Late Prof. Dr. A. D. Shinde, The Founder Director of CSIBER Trust, realized the importance of this field way back in early eighties. To realize his dream he started the College of Non-Conventional and Vocational Courses for Women (CNCVCW) at Kolhapur. He introduced innovative courses especially for women. These courses are skill oriented and help the women to find suitable placement in Food, Fashion and Interior Designing fields. At the same time they are equipped and trained to start their own business and become a source of employment for others in the society.

As a part of the academic responsibility and make the stakeholders aware about the recent trends in the three sectors, the college regularly conducts seminars, workshops and conferences. This year the college conducted a National level conference on the Recent Trends in Food Technology and Management on 28th and 29th March 2014. The conference received overwhelming response. There were almost 35 participants from different parts of the country presenting their research papers on different sub themes of the conference. In the poster presentation category there were almost 15 participants displaying their ideas and innovations in the area of Food and Management.

The topics covered in the papers submitted for the conference dealt with innovations in Food Processing industry, Bio technological aspects, Legal environment for food industry and the management trends in the sector. The national conference was able to attract good research papers on different themes from participants hailing from various states of our country. In the present issue we publish selected research papers of the conference. These papers will serve as an academic input for all those scholars interested in this specialized and emerging area.

Dr. T. V. G. Sarma
Editor

Keynote Address: Recent Trends in Food Technology

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1.0 INTRODUCTION

In today's world a food technologist gets to play a multi-faceted role, so very different from the past. Past means the 60s and the 70s when one hardly had the food industry other than some big names like Cadbury, Amul, Modern Bakery, Britannia or Parle. There were few jobs.

Today, many challenges face us creating more and more opportunities and interests. Yet, our country is still in the nascent stage of processing, except in some sectors where we have the latest capabilities, capacities and outputs.

Dairy is one such sector. Many processing units have come up across the country for other products as well. Specific zones have emerged for food processing, either because of raw material availability, or because of incentives, or may be because of the eco system that supports processing. Baddi, in Himachal, Rudrapuram in Uttarakhand, Pune- our region, Bangalore, Mysore and Hyderabad, all are emerging. And as I say we have a long way to go.

To give a glimpse, Pune region has over 1200 processing units. Our institute s created by the food industry to help the food industry. Some giants have emerged. The names include Venky's, GITS, Pravin, Weikfield, Chitales, Parampara, Rasoi Magic, Mother's Recipe, Gowardhan, Dynamics, Ferrero Rochers, Govind, Taj Frozen, Adinath Agro, Scandic Foods, Baramati Agro, Parakh Agro, Bake-lite, Mondelez and many more.

We process cereals, chocolates and confectionery, spices, ready-to-eat and ready-to-cook, flavours and colours, dairy, meat and poultry, fruits and vegetables, beverage, you name it, we have it. Drying, freezing, thermal processing, pickling or cold chain, we have it all.

In this developing world of opportunities, we have also to start looking at the key areas where the world is focussing. We review key focus areas, current technologies, upcoming technologies, and some interesting happenings.

These are the areas of Food security i.e. food for all inhabitants of the world. For the growing populations and the diminishing agricultural lands and water resources, the world bodies of food technologists are to play the key role in this area. Food losses due to mismanagement have to be minimised.

The second key area is Safe food production. Through food defence and through food safety management, it is a big challenge to ensure food

safety from farm to folk. Establishing traceability, process validations, analytical capabilities to detect and provide data for control and assurance, risk estimation and development of control mechanisms, effective management of pathogens and cross contamination possibilities, advanced cleaning and sanitation techniques.... Safe food production demands the food technologists to provide assurance. We are answerable to the retail marketers, to the governments, to the law, and to the consumers.

The third area is nutrition. Delivering nutrition of bio available nutrients and understanding bio chemistry and bio technology and looking for solutions to eliminate undesirable matter and facilitate desired nutrient, pose the challenge.

Engineering for efficient production, machine design, mechanisation, automation, process control, mechanisms, speed, documentation and record keeping, all are challenging. This is the fourth area.

2.0 CURRENT TRENDS

So, let us look at what are the new and current trends in the current technology.

While products have remained traditional, processing technologies have been emerging and changing, whether they were noodles done by hand or with simple tools or breads and cakes, desserts, beverages etc., from home made to micro and small industry, today large scale production still produce the traditional foods.

Typical technologies in use today are – Initial microbial load reduction using food grade sanitizers in mechanized operations, removal of respiratory heat by efficient chilling technologies, electronic eyes to remove defective, mechanized ways to size grade, magnetic and non magnetic sensing to alarm presence of metal, glass, rubber like materials, colour segregators, high speed pre-processing for peeling, dicing, controlled size reduction, milling, etc. Engineering design to handle varying size and shapes of produce and cutting, slitting with optical signals leading adjustment of blades to suit the profile of individual pieces at speed of few tons per hour! Super critical extractions, mechanical or solvent extractions have advanced.

Modifier for enhanced evaporation, mass transfer through maximized surface thin film creation, scraped surface and swept surface heating, multiple effect evaporation, drying by osmosis, or by sublimation, or vacuuming, vacuum frying, foam mat drying, fluidization for particulate drying, spray, dehumidifying etc are in use.

Thermal processing, agitating retorts, high speed filling, sealing that can handle liquid, solid and intermediate consistencies, sealing systems, packaging materials that can withstand temperatures, date coding at speeds of 2000 pieces per minute, exist. Instant quick freezing, plate freezing, have changed the world scene of ready to thaw, cook and serve snacks.

The future: Game changing technologies are set to come in.

Android, curved screens, virtual worlds, cloud computing, remote sensing, information management are going to change the definition of convenience.

i) Nanotechnology

Nanotechnology uses nano-scale particles created by milling, to break-down into fine, or by building back from individual atoms or molecules to self assemble. Currently, areas being explored are food packaging and pathogen detection, as well as, neutraciticals and functional foods. Encapulations of micro nutrients for targeted delivery, nano emulsions, masking of undesirable flavours, improved properties, are some of the applications. Nanotechnology is also being explored in development of nanosensors for detection of pathogenic bacteria and also for enzyme activity leading to better delivery of minerals and vitamins.

However, it is difficult to predict the long-term effects of nanotechnology. Concerns have been expressed on use of nanotechnology in food processing. Because of the small size of these nano-materials, the concern is that they may enter the food chain undetected, accumulate within tissues and organs, and can be taken up by individual cells. Therefore there are studies underway to analyse such risks and apply nanotechnology wisely.

ii) Novel sensing technology

Micro- and nano-based sensors utilize a variety of mechanisms to sense microbial and biochemical changes in food products. Non-contact ultrasound imaging technique can be used to detect foreign objects such as glass or bone fragments in boneless chicken or cheese. Spectroscopy methods, such as the Midinfrared Photoacoustic, Fourier Transform Raman and possibly Near Infrared can be used for rapid assessment of microbial contamination of food surfaces or packaging films.

iii) Optical biosensor (Surface Plasma Resonance)

Optical biosensors such as SPR (surface plasmon resonance) based pathogen detection systems provide for selective detection of microbial species. Mid-infrared biosensors, which combine bio-sensing and spectroscopy capabilities, may provide improved pathogen detection specificity.

In intelligent food packaging appropriate sensing technologies are required to detect substances in parts per trillion for food safety, quality and process control.

Development of new sensing devices may be achieved by taking advantage of miniaturization of electronics and nano-bio materials. These novel sensing systems can be used to facilitate on-line analysis of food stuffs. The devices can also be used to determine specific components in food and drinks such as sugars, proteins, vitamins and fats and to detect

and quantify chemical contaminants such as pesticides, heavy metals, and antibiotics.

They can also be used to detect pathogenic bacteria (E coli, Listeria, Salmonella, Campylobacter, Vibrio), viruses, toxins (Staphylococcus enterotoxins, Botulinum neurotoxins, Mycotoxins and Paralytic/ Diarrhetic shellfish toxins), and to monitor the freshness of aquatic foods including fish, and fermentation processes. The integration of biosensor with micro systems further revolutionizes the performance of these biosensors with respect to sensitivity and resolution, accuracy, repeatability, dynamic range, speed of response and cost.

iv) Advanced food processing techniques:

High Pressure Processing (HPP) is a mild method of preserving food products which also retains flavour and nutrients. It enables inactivation of microbes at pressures above 1000 psi

v) Pulse electric field

Pulsed electric field (PEF) food processing is a novel, non-thermal preservation method that has the potential to produce foods with excellent sensory and nutritional quality and shelf-life. Pulsed electric fields PEF is a non-thermal method of food preservation that uses short pulses of electricity for microbial inactivation and causes minimal detrimental effect on food quality attributes.

vi) Microwave Heating

Microwaves interact with polar water molecules and charged ions. The friction resulting from molecule alignment and migration of charged ions in rapidly alternating electromagnetic field generates heat within foods.

Most processed shelf-stable high moisture foods today are heat treated with pressurized hot water or steam to kill bacteria. Prolonged exposure to high temperature leads to poor product quality. Microwave sterilization is a thermal process that delivers thermal energy to foods under pressure to achieve inactivation of bacteria harmful for humans. Sharp reduction in processing time improves color, texture and other sensory attributes of foods while meeting microbial safety requirements.

vii) Bioactive Food Components

The term "bioactive food component" refers to nonessential biomolecules that are present in foods and exhibit the capacity to modulate one or more metabolic processes, which results in the promotion of better health. Bioactive food components are usually found in multiple forms such as glycosylated, esterifies, thiolyated, hydroxylated. Bioactive food components also have multiple metabolic activities allowing for beneficial effects in several diseases and target tissues. In general, it is thought that bioactive food components are predominantly found in plant foods such as whole grains, fruit, and vegetables. However, probiotics, conjugated linolenic acid, long-chain omega-3 polyunsaturated fatty acid, and bioactive peptides are most commonly found in animal products such as milk, fermented milk

products and cold-water fish.

viii) Genetically engineered food

Genetically engineered (GE) food is produced from plants, animals, and microbes that have had their genetic code modified by the selective introduction of specific DNA segments through the use of gene splicing. This process allows the organism to acquire a desirable trait such as pest protection, herbicide resistance, or improved nutritional qualities. Foods produced through genetic engineering or containing genetically engineered ingredients are also frequently known as bioengineered or genetically modified (GM) foods. Most of our food crops have been developed using traditional genetic modification techniques through plant breeding. Today's recombinant DNA techniques allow scientists to transfer desirable traits more rapidly, predictably, and precisely than when using the traditional breeding methods. The newer genetic modification techniques also enable scientists to develop traits that could not be introduced through customary plant breeding practices. The acceptability of genetically modified foods or foods with GM ingredients shall only be achieved by producing scientific evidences of food safety.

Certain natural food components that are deemed undesirable or perceived as deleterious to health can be removed or reduced to achieve healthier end products. For example, various processing procedures have been developed to remove caffeine from caffeine containing beverages or reduce anti-nutritive compounds from the natural food matrix. Artificial fats have been created to replace natural fats and oils for caloric reduction while still maintaining all the functional properties of natural lipids. Fermentation and enzymes can be used not only to break down toxic, allergenic, or anti-nutritive compounds in natural food materials, but also to enhance flavour and increase the bioavailability of essential nutrients.

Omega 3 fat, tocotrienols all are proving the need to redesign our food selection and healthy eating. Replacers for sugars, bulking agents, body modifiers and stabilizers, are setting the trend.

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Development of Lycopene Enriched Noodles

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Abstract: Present study focuses on development of lycopene incorporated noodles. The lycopene was extracted from tomato processing industry waste. The extracted lycopene was encapsulated by using sucrose and gelatin as carrier material. The encapsulation of lycopene was carried out by spray drying technique. The noodles were prepared with incorporation of free and encapsulated lycopene. The maximum degradation was occurred in noodle sample (38.8%) added with free lycopene whereas only 1.66% degradation was observed in the sample added with encapsulated lycopene. The sample added with encapsulated lycopene improves sensory attributes particularly sensory score for colour of noodles. Maximum sensory score for colour was scored by the sample added with microencapsulated lycopene was 8.5, whereas that of sample added with free lycopene was 8.3 and 8.0 for control sample. This indicated that the encapsulated sample was not influenced by the processing. This will explore new technique for stabilization of natural colornt.

Key Words: Lycopene, Noodle, encapsulation, tomato processing industry waste, extraction

1.0 INTRODUCTION

Lycopene is one of the most common carotenoids found in human serum and the predominant one found in plasma (Agarwal and Rao, 2000; Stahl and Sies, 1996). Due to the high number of conjugated double bonds, it is considered to be one of the most potent antioxidants among the carotenoids (Dimascio et al., 1989). The increase in the consumption of tomatoes and other products that contain lycopene has been associated with protection against several types of cancer (Morais, 2001), which accounts for the increasing interest in this carotenoid over recent years. Incorporation of this pigment in foods mainly aims at coloration and conferral of functional characteristics. However, due to its high number of conjugated double bonds, lycopene is susceptible to isomerization and oxidation during the storage process (Matioli and Rodriguez-amaya, 2002).

Microencapsulation can be an alternative to increase lycopene stability while enabling its dispersion in an aqueous medium. Microencapsulation has been used successfully in the food industry to protect substances that are sensitive to temperature, light, oxygen and humidity, to reduce the transfer rate from the core to the medium in which the product is located and to modify the physical characteristics of the material, facilitating handling (Desai and Park, 2005). The microcapsule consists of a layer of encapsulating material that acts like a protective film, isolating the active substance and avoiding the effects of its improper exposure (Jizomoto et al., 1993; Ré, 2006).

Lycopene encapsulation was already reported by various author the atomization method, using Gum arabic and maltodextrin (Matioli and Rodriguez-amaya, 2002), gelatin

and sucrose (Shu et al., 2006) and Gum arabic and sucrose (Nunes and Mercadante, 2007) as encapsulants.

The aim of this study was to develop micro capsules of lycopene by spray drying and use these capsules as a colorant in noodle.

2.0 MATERIALS AND METHODS

2.1 Raw materials

Fresh tomato processing industry waste of vijeta cultivar was collected from ANS Foods, Sagali, Maharashtra (India). Waste was dried in hot air oven at 50°C upto 10% moisture content. The dried wastage was ground in home grinder, packed in air tight HDPE bags, and stored in cold and dry condition until further use.

2.2 Extraction of lycopene

Estimation of lycopene was performed with slight modification in the quantitative assay for lycopene by reduced volumes of organic solvents suggested by Ranveer et al., 2013. In detail 250 mg sample was weighed and to it 3 mL of 0.05% (w/v) BHT in acetone, 3 mL of ethanol and 6 mL of hexane were added. The recipient was introduced in ice and stirred on a magnetic stirrer for 15 min. Then to it 3 mL of deionized water was added and shaken for 5 min. Sample were then left at room temperature for 5 min to allow the separation of phases. The supernatant (upper layer) was collected and one milliliter of that was diluted to 10 ml with hexane. The absorbance of the hexane layer was measured using a UV visible spectrophotometer (Shimadzu Co., Ltd., Japan) in a 1-cm-path-length quartz cuvette at 503 nm taking hexane as blank. The lycopene content was calculated by the following formula

$$\text{Lycopene } (\mu g/g) = \frac{A_{503} \times 31.2 \times \text{Dilution}}{\text{g of sample}}$$

2.3 Purification

Generally purification of the lycopene is carried out by chromatography, due to the high cost of stationary phase for chromatography; crystallization method was used for purification of lycopene (Nunes and Mercadante, 2004). The extract was dissolved in dichloromethane /ethanol (1:4) at temperature of 50 – 60°C, placed in ice bath for gradual lowered down the temperature and then placed in deep freezer for overnight to form crystals. The crystals were filtered through Whatman 4. filter paper, washed with cold ethanol and dried in freeze dryer (Cyber Lab,). The crystallization procedure was repeated to obtained crystals with higher level of purity.

2.4 Identification of lycopene by Thin-layer chromatography (TLC)

To confirm the purity of the precipitated lycopene, TLC was conducted according to the method of Britton (2008). Briefly, Silica Gel (0.25mm thick) was activated at 110 °C for 10 min was used for the TLC plates. The lycopene standard (Sigma L9879), crude lycopene and purified lycopen were developed with toluene-hexane (1:19, v/v) on the TLC plates.

3.0 MICROENCAPSULATION BY SPRAY DRYING

3.1 Preparation of emulsion

The emulsion of gum Arabic: sucrose was carried out by the procedure suggested by Zhu et al., 1998. The polysaccharide solution was prepared by dissolving 60g of gum Arebic and sucrose (7:3) in 200 ml water (45°C) by continuous starring for 30 min. The 15 mg of lycopene was dissolved in 20ml dichloromethane separately. The dichloromethane containing lycopene was mixed in polysaccharide solution by laboratory homogenizer at 7000 rpm for 30 min. In this emulsion 80 ml of distilled water was added to make 20% w/v soluble solids solution.

3.2 Encapsulation by spray drying

The microencapsulation was carried by spray drying method suggested Shu et al., 2006 with slight modification. In brief the above prepared emulsions were spray – dried on spray drier (LU-222, Labultima, Mumbai). The drying chamber with dimensions of 150 cm height and 80 cm diameter, a cyclone separator, plus hot air blower and a exhaust blower. The emulsion was fed at the speed of 2 ml /min into the drying chamber, entrance and exit air temperatures of 170 ± 2 and 113 ± 2°C, respectively, air pressure of 2 kgf/cm^2 from the blower in co-current flow mode and spray dried microcapsules were collected in the cyclone separator driven by exhaust blower.

3.3 Lycopene content of purified sample

Lycopene purity was determined using a spectrophotometery method similar to that reported by Schierle et al. (1997). Briefly, a certain weight of lycopene sample was dissolved in hexane and then diluted, which was assessed on a UV spectrophotometer (Shimadzu Co., Ltd., Japan) at λ max = 503 nm. Lycopene purity (or content) was calculated according to the following formula:

$$\omega = \frac{Ad}{Em}$$

Among which, ω —lycopene purity (or content), A— absorbance, d—dilution times, E = 3140, which is the extinction coefficient of lycopene at λ = 471 nm when n-hexane is used as solvent; m—weight of lycopene sample.

3.4 Lycopene incorporated Noodle

The control noodles were prepared as per the procedure discribed by Kulkarni *et al.,* 2012. The controlled noodle were made-up from refined wheat flour (100g) mixed with Iodized salt (2%), baking powder (0.5%) and water (35 ml).The sensorial quality characteristics like elasticity and texture were improved by addition of corn flour (10%), gluten (5%), GMS (1%) and guar gum (1%), whereas vegetable oil (10%) was added to improve the glossiness of the noodles. All these ingredients were mixed to form dough and extruded using single screw extruder. Obtained noodle strains were steamed and dried in a tray dryer at 60°C. The other two batches were prepared similarly as per the procedure stated above with addition of 1% free lycopene (Without encapsulation) and 1% encapsulated lycopene respectively.

3.5 Sensory evolution

All the noodle and milkshake samples were checked for market suitability by organoleptic test, which was conducted on 9

point hedonic scale. All the samples were judged for different sensory attributes like appearance, colour, taste, flavour and overall acceptability by a panel of semi-trained panel members (Ranganna 2000).

4.0 STASTICALANALYSIS

The analytical data obtained for experiments were subjected to analysis of variance (ANOVA) (one way anova) using complete randomized design according to Panse and Sukhatme (1961). The critical difference at $p<0.05$ was estimated and used to find significant difference if any.

4.1 Results And Discussion

4.1.1 Lycopene content of various sources

The proximate composition of peels showed that the Vijeta cultivar had higher values for lycopene and carotenoid content, so it was taken for further study. Different tomato fruit parts i.e. whole tomato, tomato pulp and peel, and industrial waste were screened for the lycopene content by solvent (tri-mixture) extraction method and obtained results are expressed in µg/g (table 1). The data revealed that higher value for lycopene content was found in peel (373.17±1.13 µg/g) followed by industrial waste (175.17±1.09 µg/g), whole tomato (80.90±0.79 µg/g) and tomato pulp (42.6±0.81 µg/g) on dry wet basis. This indicated that lycopene was accumulated in higher amount in peel than the other parts. Sharma and Le Maguer (1996) found that tomato extracts, especially skin extracts contain high amounts of lycopene. The tomato processing industry waste include seeds and skin residues which may leads to lower down lycopene content than the peel.

The results obtained for extraction of lycopene from tomato peel differ from those obtained using whole tomatoes, on account of the differences in the chemical composition of the peel and the whole fruit, as well as due to the fact that lycopene is reported to occur in higher concentrations in tomato peel. The peel of tomatoes has the highest total carotenoid concentration, and the locular contents have the highest carotene content. It has been reported that lycopene represents a substantial proportion of the total carotenoid content of tomato products (Choudhari and Ananthanarayan, 2007). It is estimated as much as 60–64% of the total carotenoid content consists of lycopene. Considering whole tomatoes, the peel content will be low (5.5–8.1%), which is the reason for lower lycopene content (Barrett *et al.*, 1998).

Lycopene was found predominantly in the chromoplast of plant tissues. In tomatoes, lycopene biosynthesis increases dramatically during the ripening process, as chloroplast undergoes transformation to chromoplast. Globulous chromoplast containing mainly b-carotene is found in the jelly part of the pericarp while chromoplast in the outer part of the pericarp contains voluminous sheets of lycopene (Choudhari and Ananthanarayan, 2007). Sharma and LeMaguer (1996) found that tomato extracts and especially skin extracts contain high amounts of lycopene.

The tomato processing industry waste comprises of skin and seeds (approximate in the ratio of 37:63), which lower lycopene content (Machmudah *et al.*, 2012) as seeds do not contain lycopene. However considering the cost of production of lycopene, it can be concluded that the waste of tomato processing industries, in the form of seeds and skin residues, could provide a useful source of lycopene (Sadler *et al.*, 1990).

Table 1.
Lycopene content of different sources of tomato

Sr. No.	Sample Name	Lycopene (µg/g)
1	Whole Tomato	80.90±0.79
2	Tomato Pulp	42.6±0.81
3	Peel	373.17±1.13
4	Industrial waste	175.17±1.09

Results are mean ± SD of 3 determinations

4.1.2 Identification of purified lycopene by Thin-layer chromatography (TLC)

To confirm the purity of lycopene, TLC was performed and chromatogram is presented in figure 1. The figure shows that crude extract sample gave 3 coloured spots i.e. red (Rf = 0.16), orange (Rf = 0.58), and yellow (Rf = 0.75), while purified lycopene sample gave a single red spot, which indicates that the extract is free from other carotenes. The Rf value of the red spot of purified sample was the same as that of lycopene standard. The orange and yellow spots of the crude extract represent γ-carotene and β- and ζ-carotene, respectively (Britton, 2008; Myong-Kyun *et al.*, 2013). This confirms that crystallization method used for purification of crude extract of lycopene sample was appropriate.

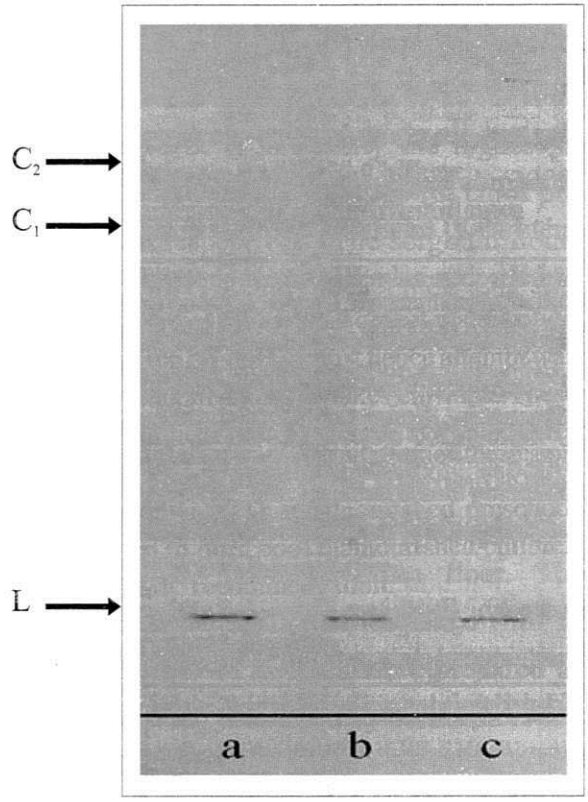


Figure 1. TLC of lycopene and carotenoids from (a) lycopene standard, (b) crude Extract, (c) purified lycopene. The arrows indicate L, lycopene; C_1, γ-carotene; C_2, β-carotene and ζ-carotene.

4.2 Structural analysis of encapsulated lycopene

The encapsulated samples prepared from sucrose : gum Arabic combinations of optimized process conditions i.e. core to wall ratio (1:4), sucrose to gum Arabic (7:3) and inlet temperature (180°C) were subjected to SEM analysis. Also the lycopene crystals without encapsulation were subjected to SEM analysis. Obtained SEM images are illustrated in figure 2. Micrographs of lycopene without encapsulation looked saw dust like surface, whereas microcapsules showed a spherical

shape appearance with 2–15 μm in diameter (mean diameter of 5 μm), smooth outer surface and a "bee net" like inner structure in of encapsulating materials (i.e. Sucrose – Gum Arabic combinations).

The formation of smooth outer surface were probably attributed to the addition of sucrose in the formulation, which could retain some water molecules linked to its own structure, filling the intern empty space of the microparticles, preserving the hydration, avoiding depressions on the surface, and thus assuring a more uniform and smooth wall of the obtained micro-particles. Bruschi et al. (2003) had reported that manniol to gelatin combinations as encapsulating material successfully resulted into a spherical and smooth-surfaced micro-particle of propolis. The reason for formation of "bee net"-like inner structure was unclear so far, but it seemed to be associated with the evaporation rate of water in core of micro capsules during micro encapsulation (Shu et al., 2006).

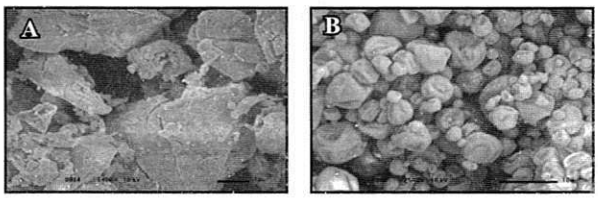


Figure 2. SEM image of (A) lycopene without encapsulation, (B) Lycopene encapsulated with sucrose and gum Arabic

4.3 Effect of lycopene incorporation on physicochemical properties of Noodles

The controlled noodle sample and sample added with free and encapsulated lycopene were subjected to physico-chemical analysis; obtained results are presented in table 2. The results of physico chemicals analysis showed that all noodle samples were good source of total carbohydrates and protein. The incorporation of lycopene in noodle samples did not showed any significant difference in protein, fat, ash and moisture content. Slight increased carbohydrate content was observed in the samples added with encapsulated lycopene i.e. NL_3 (76.10%), this was due to use of sucrose and gum Arabic as a carrier materials for encapsulation. Whereas carbohydrate content of control sample NL_1 (74.48%) and sample NL_2 (73.83%) added with lycopene without encapsulation was having little difference. The significant change in lycopene content was observed in the noodle samples. Only 0.012% lycopene content was recorded in the sample NL_2 which was supplemented with free lycopene (without encapsulation). Very good retention was observed in sample NL_3 (0.290%) supplemented with encapsulated lycopene. Even though noodle samples were added with 1% encapsulated lycopene; it contains only 30% of lycopene and 70% of carrier materials, which leads to lower lycopene content in the noodle sample. If the results of lycopene content of sample NL_2 and NL_4 were compared among each other, it showed that samples added with encapsulated lycopene (NL_3) had better retention than sample added with free lycopene. This also indicated that encapsulation gave better protection against heat processing.

Table 2. Physico-chemical compositions of noodle samples

Constituents	NL_1	NL_2	NL_3	SE	CD (p=0.05)
Moisture (%)	11.12	11.69	9.92	0.448	1.426
Ash(%)	0.895	0.890	0.846	0.015	0.046
Protein (%)	11.93	12.04	11.77	0.059	0.188
Fat (%)	1.58	1.55	1.46	0.026	0.083
Total Carbohydrate (%)	74.48	73.83	76.10	0.553	1.758
Crude fibre (%)	0.30	0.32	0.28	0.015	0.047
Lycopene (%)	---	0.612	0.290	0.081	0.258

Sample NL_1: control sample, Sample NL_2: sample added with free lycopene (Without encapsulation), Sample NL_3: Sample added with encapsulation lycopene (sucrose - gum Arabic)

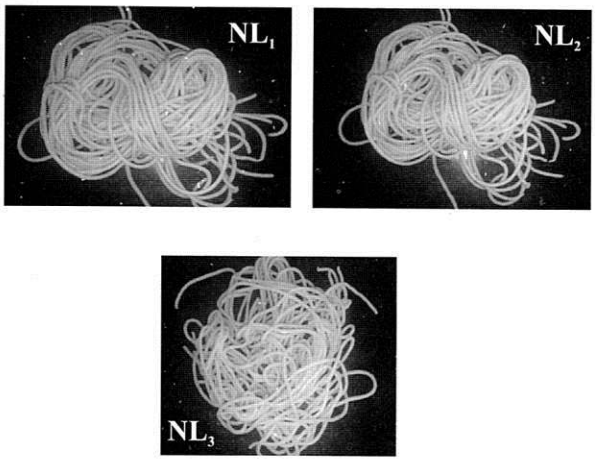
4.4 Effect of lycopene incorporation on sensorial properties of Noodles

All the noodle samples were subjected to sensory analysis to judge the market suitability of samples and obtained results are given in table 3. The photograph showing effect of lycopene addition is given in figure 4. All the samples showed at par results of sensory analysis with respect to flavor, taste, texture and overall acceptability, except for appearance. Samples NL_3 (8.5) which were prepared by incorporation of encapsulated lycopene had better sensory score for appearance than the control noodle sample (8.0). Even sample NL_2 (8.3) which was prepared by incorporation of lycopene without encapsulation had higher score for appearance than the control sample. This may be due to the likingness of the panel members towards slightly reddish appearance of lycopene added noodles.

Table 3. Effect of lycopene incorporation on sensory attributes of noodle samples

Samples	Appearance	Flavour	Taste	Texture	Overall Acceptability
NL_1	8.0	8.0	8.5	8.0	8.0
NL_2	8.3	8.0	8.5	8.2	8.0
NL_3	8.5	8.3	8.7	8.1	8.50
SE	0.118	0.075	0.058	0.048	0.144
CD (p=0.05)	0.376	0.238	0.184	0.152	0.459

Sample N_1: control sample, Sample N_2: sample added with free lycopene (Without encapsulation), Sample N_3: Sample added with encapsulation lycopene (sucrose - gum Arabic)



Sample NL_1: control sample, Sample NL_2: sample added with free lycopene (Without encapsulation), Sample NL_3: Sample added with encapsulation lycopene (sucrose - gum Arabic)

Figure 4. Effect of lycopene addition on appearance of noodle

5.0 CONCLUSION

The different parts of tomato showed peel (376.17±1.13) content highest amount of lycopene followed by industrial waste (176.17±1.09), whole tomato (83.90±0.79) and pulp (47.6±0.81). TLC analysis showed single spot characteristic spot of lycopene in purified sample. Degradation of lycopene was observed during processing when free lycopene was added in noodles. Results of these studies will helpful to small scale entrepreneurs and tomato processer to use their waste for extraction of value added pigment. This study also helps to improve storage stability of lycopene.

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Impact of Convenient Soya Products Supplementations on Vitamin Intake of Malnourished Preschool Children

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ABSTRACT : Protein calorie malnutrition is major nutritional problem of the world. To treat malnutrition among the preschool children the formulation of locally based protein rich product is must hence attempt was made to formulate soyabased food products such as soyaladoo, soyachakali and soyaflakes chiwada. These products were evaluated for its minor and major nutrients. The status of vitamins like vitamin B_1, vitamin B_2, vitamin C ,niacin & β carotene etc consumption significantly increased after supplementation of these soya products to preschool malnourished children for six months respectively. The malnourished preschool children were classified as grade II & III. These products were given to preschool malnourished children @50 gm product/day /child. It provides energy, protein & fat as per ICMR recommendation.

Key Words: Soyladoo, soyachakali, soyaflakes chiwada and Supplementary Feeding

1.0 INTRODUCTION :

Soyabean is oilseed legume group getting its importance as cash crop as well as legume crop. It contain 40 per cent of protein. Among all legume it is only the cheapest legume having nutracetical properties. It content almost all nutrients and plenty of antioxidantive properties. (Ghatge N.S. 2013) It content isoflavonoids. The amino acid pattern of the soyabean is similar to cow milk. The proteins are alkaline in nature. Due to its high biological value it content good number of essential amino acids. Hence it can be used to prevent protein calorie malnutrition among vulnerable group of community. The regular intake of traditional soya foods help to prevent –breast cancer, postrate cancer, color cancer and menopausal problem of women Kaushik (2010). Regular intake of soyabean also prevent hyper cholesterol level in the blood; by preventing atherosclerosis Messina (1997) Consumption of soyabean daily suitable for diabetic patients. It also prevents osteoporosis in elderly person. It content emulsifier and helps in dispose of fatty material from vital organs.

2.0 MATERIALS AND METHODS :

2.1 Formulation:

Formulation and preparation of soyaladoo, soyachakali and soyaflakes chiwada was done by using standard method by (Phillips & Thangana 1971)

2.2 Sensory Evaluation :

Soya products were prepared and evaluated organoleptically by "Hedonic scale" (Amerine et al. 1965).

2.3 Nutritional Evaluation:

Nutritional quality analysis. Moisture content, total ash, major nutrient like crude protein, fat, carbohydrates, B complex vitamins including vitamin B_1,B_2 and B_3 , minerals such

as iron, calcium, zinc and crude fiber were analyzed by use of methods described in (AOAC1984 and Rghunramula 1983)

2.4 Statistical analysis :

The analysis significant at $p < 0.05$ level, S. E. and CD. at 5 per cent level by the procedure given by (Gomez and Gomez 1984).

3.0 RESULTS AND DISCUSSION

Figure 1.1 expressed the month wise intake of thiamine (vitamin B1) by experimental groups during entire period of supplementation. It shown that, only Group I which provided soyaladoo as a supplementary food observed a moderate adequate per cent of intake of thiamine. In the initial level it was noticed as 79.2 per cent thiamine intake and found increased up to 85.0 per cent in the last month of period. The ranging in per cent of thiamine intake of Group II reported as 74.0, 75.6, 76.7 77.5, 78.1 and 80.0 per cent month of I, II, III, IV, V and VI respectively. Group III noticed in IIIrd position according to their month wise thiamine intake very low per cent intake of thiamine was shown in control group.

Figure no. 1.2 gives an idea about the month wise intake of riboflavin (Vitamin B_2) by experimental groups during the supplemented period. It revealed that, there was slightly difference noticed in month wise intake of riboflavin among group I,II and III. However, the remarkable change was reported as compared between the intakes of riboflavin in groups I, II and III with control group. A steady intake of riboflavin was found in all the months (Ist to VIth) in control group during entire period of supplementation.

A similar observations were noted in the month wise intake of niacin (vitamin B_3) among Group Ist, IInd, IIrd and control i.e. IVth shown in Fig 1.3. Month wise intake of niacin group I slightly found at upper per cent level than that of group II and III. Where as the intake of niacin ranging as 41.0 to 44.0 Per cent from Ist to VIth months respectively.

Month wise intake of vitamin 'C' among different experimental groups were given in figure 1.4. It shown that, at beginning Ist to II nd months intake of Vitamin 'C' was noted more in Group Ii,. It was found decreased from 67.1 per cent in II nd month to 65.4 per cent in IIrd month. However, vitamin C intake in the month of Ist noted as 62.5 per cent and increases to 75.9 per cent in VIth month in Group I. There was no remarkable change observed in vitamin C intake in the months of I, II and III among groups II and III. Control group found lower intake of vitamin C during the entire period experiment.

From the beginning month, group IInd preschool going children who were supplemented with soyachakali reported higher intake of β carotene during entire period of supplementation shown in Fig 1.5. This group noted β carotene intake Ist month was only 41.0 per cent and found increases to 56. Per cent in VIth month of experiment. Group I and III observed IInd and IIIrd position according to their month intake of β carotene at decreasing level

as increasing the months of experimental period. Intake of β carotene in group IV i.e.control noted 38.0 per cent and found decreased as 36.0 per cent in last month of experiment.

Average the B complex vitamin composition show in table 1 group of vitamins, intake of thiamine by group I was recorded as highest i.e.0.65 mg which recorded as 78.7per cent. Followed by group II it was noted as 0.60(mg)±0.1 and group III who observed as 0.54(mg)±0.1 intake of thiamine. Control group found to consumed vitamin B_1 as 0.31(mg) 0.06which was reported as only (41.3) per cent. Vitamin B_2 or riboflavin consumption of group I recorded more i.e. 0.63(mg)±0.14and (72.9per cent) which was higher than soyachakali group II and soyaflakes chiwada group i.e. III. The control group consumed only 0.33(mg)±0.1 and(38.8per cent) intake of riboflavin which reported as poorly adequate level. The mean intake of vitamin B_3 or niacin by group I again found as highest score i.e. 0.62(mg)±0.11 it was noted in II rank in group II and III position in the average intake of niacin reported in Group III. Minimum average in niacin intake was observed in control group 0.40(mg)±0.9. A similar average intake of vitamin C was noted by group I and II i.e. 27.2(mg)±1.7and it was noticed below the moderate adequate level (68.0per cent). Where as group III shown vitamin C intake as 25.8(mg)±0.9 which was reported as be low the adequate level (i.e. 62.5 per cen. Very low per cent per cent in vitamin C intake (i.e.56.0) was noticed in control group.

In case of fat soluble vitamin like β carotene intake by all supplemented groups was noticed higher than control group. Among all, group II had highest intake of β carotene as compared with group I and III. The intake of β carotene intake in Group I, II and III was recorded as 1128(μg)±40.1, 1176 (μg) ± 8.5 and 1080(μg) ±7.3 respectively. Very poor intake of β carotene was noted by control group i.e. 757.1(μg)±7.9. Which was observed as below the adequate level. i.e. 47.3 per cent.

The data about average β carotene intake by different experimental groups was recorded in Table 7.11. It indicated that, highly significant increase in percent intake of thiamin was noticed in Group IO (78.0) and Group III (76.0) after supplementation Group III found significant increase form 58.7 to 69.3 per cent in thiamin intake after supplementation. Control group was also noted a significant increase in consumption of vitamin B_1 (from 03to 0.4 mg) after 6 months of experimental period. Average intake of vitamin B_2 or riboflavin was noted increases at highly significant level only in Group I. It was noticed as increased from 64.7 to 74.0 per cent after supplementation. Group III scored in 2nd position, as it found increased vitamin B_2 intake from 60.0 to 73.9 per cent. Where as group II recorded in IIIrd position in the per cent intake of vitamin B_2 (71.8) after supplementation. No significant difference was noticed in control group regarding intake vitamin B_2 before and after supplementation.

In case of vitamin B_3 average intake,

group III and II secured I[st] and II[nd] rank. It noted that, group III found increased the intake of vitamin B_3 from 410 to 61.0 per cent, Group II reported increasing of vitamin B_3 intake from 42.0 to 64.2 per cent These increase in the intake of vitamin B_3 noted as highly significant level among group III and II. However, the per cent of vitamin B_3 was not shown at adequate level. Group I reported as significant increase in per cent of vitamin B_3 intake from 44.2 before supplementation to 65.3 per cent after supplementation. Control group did not found any change in the intake of vitamin B3 after 6 months experimental period.

The average intake of vitamin C was not reported any difference among all the experimental groups as in before and after supplementation period.

β carotene intake was highly significant increased is a group I, II and III after supplementation. Group I, II and III reported as increased its intake of β carotene from 31.3 to 78.5, 36.0 to 73.5 and 20.4 to 67.5 per cent respectively. Control group was also noted increase in β carotene intake at significant level (from 20.4 to 47.3 per cent) after experimental period. However, none of the experimental group found its intake of β carotene at adequate level after supplementation.(Ghatge N.S 2012)

4.0 CONCLUSION:

On whole it can be concluded that the supplementation of soya products to preschool malnourished children have seen significantly increased in their B complex vitamins and β carotene except vitamin C.

Fig. 1.1 Thiamine intake of different experimental groups of preschool children

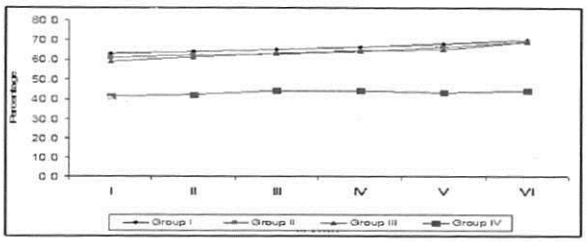

Fig. 1.2 Riboflavin intake of groups of different experimental preschool children

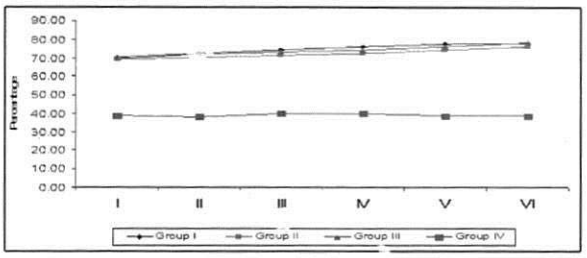

Fig. 1.3 Niacin intake of different experimental experimental groups of preschool

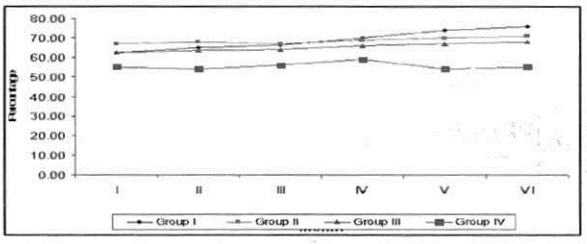

Fig. 1.4 A Ascorbic acid intake of different groups of preschool children

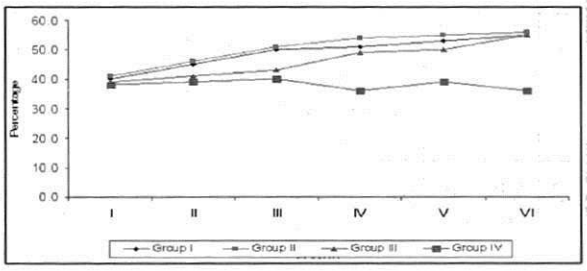

Fig. 1.5 β carotene intake of different experimental groups of preschool children

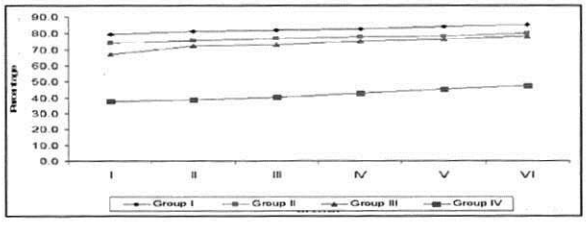

Table No.1 Average Nutrients Intake of Experimental Groups

1	Vitamin B(mg)	0.65±0.1(78.7)	0.60±0.1(76.5)	0.54±0.1(72.0)	0.31±0.1(41.3)
2	VitaminB 2(mg)	0.63±0.1(72.9)	0.61±0.1(71.8)	0.62±0.1(72.9)	0.33±0.07(38.8)
3	Vitamin B(mg)	0.62±0.1(65.3)	0.61±0.1(63.0)	0.60±0.1(62.0)	0.40±0.9(42.0)
4	Vitamin C(mg)	27.2±1.7(68.0)	27.2±1.5(68.0)	25.8±0.9(62.5)	22.4±1.4(56.0)
5	β Caroten(µg)	1128±14.1(70.5)	1176±8.5(73.5)	1080±7.3(67.5)	757.1±7.9(47.3)

Group I -
Experimental group with supplementation of soyaladoo.

Group II -
Experimental group with supplementation of soyachakali.

Group II -
Experimental group with supplementation of soyaflakes chiwada .

Group IV -
No supplementation i.e. control group.

Figures in parentheses indicate percentage.

Table No 2 : Average Vitamins Intake of Experimental Groups with their before and after Supplementation

Sr. No.	Vitamins	Group I Mean ± S.D.			Group II Mean ± S.D.			Group III Mean ± S.D.			Group IV Mean ± S.D.		
		BS	AS	't' value	BS	AS	't' value	BS	AS	't' value	BS	After 6months	't' value
1	Vitamin B1(mg)	0.4± 0.1 (58.7)	0.7± 0.1 (78.0)	3.8 **	0.4± 0.1 (57.6)	0.7± 0.1 (76.0)	3.2 **	0.4± 0.1 (58.7)	0.5± 0.1 (69.3)	2.7 *	0.3± 0.0 (41.3)	0.4± 0.1 (58.7)	2.7 *
2	Vitamin B2 (mg)	0.6± 0.1 (64.7)	0.7± 0.1 (74.0)	3.1 **	0.5± 0.1 (63.5)	0.6± 0.1 (71.8)	2.8*	0.5± 0.1 (60.0)	0.6± 0.1 (73.9)	2.6*	0.3± 0.1 (38.8)	0.3± 0.1 (40.0)	1.3 NS
3	Vitamin B(mg)	0.4± 0.1 (44.2)	0.6± 0.1 (65.3)	2.7 *	0.4± 0.1 (42.0)	0.6± 0.1 (64.2)	3.4 **	0.4± 0.1 (41.0)	0.6± 0.1 (63.1)	3.5 **	0.4± 0.1 (42.1)	0.4± 0.1 (42.1)	0.0 NS
4	Vitamin C(mg)	27.2± 3.7 (68.1)	27.2± 3.7 (68.1)	0.0 NS	27.0± 3.7 (67.5)	27.2± 3.7 (68.0)	0.70 NS	24.3± 3.3 (60.8)	25.8± 3.5 (64.5)	0.12 NS	22.0± 3.0 (55.0)	22.04± 3.0 (55.1)	0.10 NS
5	ß Carotene (µg)	500± 3.7 (31.3)	1128± 15.0 (78.5)	6.1 **	576± 6.7 (36.0)	1176± 16.6 (73.5)	3.9 **	326± 14.5 (20.4)	1080± 14.5 (67.5)	4.2 **	326± 4.5 (20.4)	757.1± 10.4 (47.3)	2.8 **

GroupI-
Experimental group with supplementation of soyaladoo.

Group II -
Experimental group with supplementation of soyachakali.

Group II -
Experimental group with supplementation of soyaflakes chiwada.

Group IV -
No supplementation i.e. control group.

Figures in paran theses indicate percentage.
* significant at 5 per cent level
** significant at 1 per cent level
NS Non Significant,
BS – Before supplementation,
AS – After supplementation
Average Vitamins Intake of Experimental Groups with Their Before and After Supplementation.

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Effect of Legume Flours Addition on Chemical Characteristics of Sorghum Bhakri (Unleavened Flat Bread)

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Abstract: Bhakries prepared with sorghum flour and substitution with chick pea and soybean flours separately were evaluated for chemical characteristics and protein content. It was observed that the chemical composition of bhakries prepared from sorghum and enriched flours did not differ significantly for moisture, and ash contents while differed significantly for total carbohydrate, crude protein and crude fat content. The composition of bhakries were also found to be non-significantly different for crop years with sorghum flours and legume flour combinations whereas legume flour combinations differed significantly with one another with respect to enriched bhakries composition. The mean values of moisture, crude protein, crude fat, ash and total carbohydrate ranged from 30.35 to 36.73%, 6.66 to 11.39%, 0.63 to 2.23%, 0.3 to 1.29% respectively for bhakries prepared from sorghum and chick pea enriched flour and the mean values of moisture, crude protein, crude fat, ash and total carbohydrate ranged from 30.35 to 36.73%, 6.98 to 16.25%, 0.78 to 4.51% and 0.37 to 1.44% respectively for bhakries prepared from sorghum and soybean enriched flour.

Key Words: Sorghum; Chick pea; Soybean; bhakri; Chemical characteristics

1.0 INTRODUCTION:

Grain sorghum [Sorghum bicolor (L.) Moench] is an important food crop particularly in arid and semi-arid tropics. It is a dual-purpose crop providing staple food for human consumption (35%) and rest of as a fodder for livestock, alcohol production, as well as preparation of industrial products (Awika and Rooney 2004). Many millions of people in Africa and Asia depend on sorghum as the stuff of life. Unfortunately, lysine is the first limiting amino acid in sorghm flour. Tryptophan, threonine and methionine are also low in sorghum when compared to the FAO standards (FAO/WHO, 1973). The deficiencies of essential amino acids lead to poor utilization of proteins and thus contribute to the prevalence of malnutrition. The cereal are deficient in lysine further aggravate the situation due to its losses during baking. The lysine is destroyed more than 10% during baking (Saab et al., 1981). Protein deficiency also results in predisposition to parasitic and infectious diseases and general ill-health. The specific maladies such as Kwashiorkor and Marasmus are more prevalent due to protein deficiency. In adults, apart from direct ill-health, protein deficiency results in reduced capacity for physical work. Altogether, sorghum is one of several really indispensable crops required for the survival of man. In India, sorghum is mainly consumed in the form of unleavened pancake (bhakri/roti). However, several indigenous processed foods such as bhatwadi, papadi, and roti are prepared and consumed in the semi-arid tropics (Salunkhe et al. 1984). The scientists have made various attempts to improve protein content and quality of sorghum flour through different means. They

have carried out studies on the preparation of the composite flours comprising sorghum supplemented with protein rich materials of different products with legume and oilseed flours (Chavan, Kadam, & Salunkhe, 1989). Legume flours significantly improve the quality of sorghum flour because of its high contents of protein and essential amino acids especially lysine. This situation demands to explore the possibility of improving the sorghum based foods such as bhakries, breads, noodles and crackers with protein sources (Anyango, De Kock, & Taylor, 2011; Pelembe, Erasmus, & Taylor, 2002) This approach seems to be more feasible and exhibits advantages of substantial enhancement in the protein content and at the same time it helps correcting the amino acid balance deficiencies and consumer acceptability (Akinyele & Fasaye, 1988). Proteins from legumes may help in solving protein deficiency problems to combat the malnutrition prevalence in different regions of Maharashtra. The use of legume flours for preparation of indigenous products such as bhakri has not been carried out extensively. Thus there was a need to explore the possibility of using legume protein enriched sorghum flour for the production of nutritious bhakri without sacrificing its functional and sensory characteristics. Therefore, the present study was undertaken to find out the suitable proportion of legume flours into sorghum flour for the production of protein enriched bhakries and also to find out acceptability of bhakries prepared from legume enriched sorghum flours.

2.0 MATERIALS AND METHODS

2.1 Procurement of Raw Material

Sorghum variety Phule Vasudha was purchased from the Sorghum Research Station, Mahatma Phule Krushi Vidhyapeeth, Rahuri (MS). Chick pea variety Vijay and soybean variety JS 335 were collected from the Pulses Improvement Project, Mahatma Phule Krushi Vidhyapeeth, Rahuri (MS).

2.2 Cleaning of raw material

Sorghum, chick pea and soybean were cleaned manually to remove dust particles, damaged seeds and other impurities.

2.3 Preparation of flours

All grains were tempered at 10% moisture by following the procedure of AOAC 1990 and milled in stone chakki to obtain flour followed by sieving through 20 mesh sieve and packed in separate air tight containers and stored at room temperature until utilized.

2.4 Partial replacement of legume flour

Legume flours (soybean and chick pea) are replaced 10, 20 and 30 % with respect to sorghum flour separately

2.5 Preparation of bhakies

Put the flour in a wide plate or mixing bowl. Add water bit by bit till the flour can be gathered up into a ball of dough Form into a thick circle working with finger tips with the patty between the palms of (floured) hands. Turn out onto floured surface and continue to form a circle pressing it out with the finger tips. Heat a tava or griddle (temperature around 300-

325° C) and put the bhakri on it. After 2 to 3 minutes the bhakri starts becoming opaque. Sprinkle some water on the surface by hand. After two minutes turn the roti around and cook on the other side for 20 to 30 sec. time. Turn over twice more till the roti develops brown spots all over and becomes a lighter colour in between.

2.6 Proximate analysis

All flours and bhakries were analyzed for moisture, crude protein, crude fat, crude protein, total ash and total carbohydrates content according to their methods described in AOAC 1990.

2.7 Statistical Analysis

The data was statistically analyzed by performing analysis of variance technique and interpreted according to Duncan's Multiple Range Test at 5% level of probability.

3.0 RESULTS AND DISCUSSION:

3.1 Proximate analysis

3.1.1 Moisture content

The statistical analysis revealed that moisture content of bhakri was not affected significantly by the crop years as well as sorghum flour. The interaction of crop years, sorghum with chick pea and sorghum with soybean flour combinations was also found to be non-significantly different with one another. It is obvious from the results that the moisture content of bhakries among legume flour combinations differed significantly. The average moisture content of bhakries prepared from chick pea and soybean flour enriched sorghum flour is shown in Table I. The data showed that the moisture content in bhakries was found to be significantly the highest in sorghum flours enriched with 30% of chick pea and soybean respectively. The sorghum flours enriched with 10 and 30% chick pea and soybean flour were found to be statistically at par with respect to moisture content. The lowest moisture was obtained in the bhakries prepared from sorghum flour enriched with 10 % chick pea and 10 soybean flour followed by bhakries prepared from whole sorghum flour. The bhakries from sorghum flour enriched with 10 and 30 % chick pea flour and 10 and 30 % soybean flour yielded identical moisture content. The bhakries prepared from sorghum flour enriched with 20 and 30% legume flours significantly contained higher moisture content than the bhakries prepared from un-enriched sorghum flour. The studies conducted by Bhat and Vivian (1980) had indicated that the moisture contents in chapattis were 32.6 to 36.0% when supplemented with soy, peanut and cottonseed flours while moisture contents in whole wheat chapati was 35.5%. The moisture content found in the present study is well correlated to the findings of these workers. However, significant variation among the enriched sorghum flour may be due to higher water holding capacity of the legume flours. However, the baking conditions also have pronounced effect on the moisture content of bhakries. Since the conditions were kept identical throughout the experimentation. Therefore, the variation may be due to addition of legume flours in sorghum flour.

3.1.2 Crude Protein:

The crude protein content of bhakries also did not differ significantly due to interaction of crop years with wheat flours and oilseed flour combinations. The results indicated that the bhakries prepared from different combination of legume flours possessed significant differences in protein content. The mean value for crude protein content is presented in Table II. The protein content was found to be the highest in bhakries prepared from sorghum flour enriched with 30% soybean flour. The bhakries prepared from sorghum flour enriched with 20% chick pea and 10% soybean flour did not differ significantly for this chemical constituent. The lowest crude protein content was recorded in bhakri prepared from un-enriched sorghum flour followed by the bhakries prepared from sorghum flour enriched with 10% chick pea flour and 10% soybean flour. The data on crude protein content showed that there was a significant increase in the crude protein content of bhakries when prepared from legumes enriched sorghum flour. Jan et al. (2000) has reported an increase in the crude protein content of chapatties enriched with oilseed flours. Rawat et al. (1994) also reported an increase in protein level of soy flour fortified chapatties. Ghandi et al. (2000) observed increase in protein contents from 11.9 to 19.8% at 20% blending level of defatted soy enriched chapatties. The protein content of chapatties prepared from wheat flour enriched with soy, peanut and cottonseed flour was higher in chapatties prepared from whole-wheat flour (Bhat & Vivian, 1980).

3.1.3.Crude fat

Crude fat content was not affected significantly by the crop years, sorghum flour and the interaction of crop year with sorghum flour and legume flour combinations. It also showed that the legume flour combinations differed significantly with one another with respect to crude fat content of bhakries. The crude fat content of bhakries prepared from legume enriched sorghum flour is shown in Table III. The results regarding bhakries prepared from enriched sorghum flour showed same trend for fat content, which was observed in case of the respective enriched flours. It was observed that the crude fat content was found to be the highest in bhakries prepared from 30% soybean enriched sorghum flour. The bhakries prepared form sorghum flour enriched with 20% chick pea and 10% soybean gave statistically identical values for fat. Significantly minimum crude fat content was found in the bhakries prepared from un-enriched sorghum flour followed by the bhakries enriched with 10 and 20% chick pea flour. The increase in crude fat content of bhakries prepared from legume flours enriched sorghum flour in the present study are in line with the findings reported by Jan et al. (2000) and Bhat and Vivian (1980) who found that chapatties prepared from oilseed blended flours contained higher crude fat content. Since the results reported previously indicated that flour enriched are higher in crude fat content than the un-enriched cereal flours. Total ash

Ash content of bhakri differed significantly due to the crop years and sorghum flour. The

interaction of crop years with sorghum flour and legume flour combinations was found to be non-significant for this constituent. The results further showed that legume flours combinations differed significantly with one another with respect to ash content of bhakri. The mean ash content of bhakries prepared from different legume enriched sorghum flour is shown in Table IV. The data revealed that the ash content was found to be significantly higher in bhakries prepared from sorghum flour enriched with 30% soybean. The bhakries prepared from sorghum flour enriched with 10% chick pea and 10% soybean flour were found to be statistically at par with respect to ash content. The ash content of bhakries prepared from sorghum flour enriched with 10 and 20% chick pea and 10% soybean also did not differ significantly for this chemical constituent. The lowest ash content was found in the bhakries prepared from un-enriched sorghum flour followed by enriched with 10% chick pea and 10% soybean flour. The variation in ash content between bhakries prepared from sorghum flour enriched with 10% chick pea and 10% soybean flour were found to be non-significant. The increase in total ash content of bhakries prepared from legume flours enriched sorghum flour in the present study are in range with the findings reported by Jan et al. (2000) and Bhat and Vivian (1980) who found that chapatties prepared from oilseed blended flours contained higher in total ash content. Since the results reported previously indicated that flour enriched are higher in total ash content than the un-enriched cereal flours.

4.0 CONCLUSION:

The results of the present study indicated that there was a significant increase in moisture, crude protein and ash contents in bhakries prepared from sorghum flour enriched with chick pea and soybean flours. It is evident from this study that enrichment of sorghum flour with legume flours not only increased the protein content and ash content of the enriched flours but also increased the level of these constituents in the bhakries as well. This further showed that sorghum flour enrichment with legume flours may help to improve the nutritional status of masses whose staple diet is bhakri.

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Table I. Moisture (%) of bhakries prepared from different legume enriched flours

Years	Sorghum flour	Chick pea flour	Soybean flour	Control	Sorghum + Chick pea			Sorghum +Soybean		
					10	20	30	10	20	30
2011 - 12*	10.10	10.03	10.22	33.23	30.32	33.83	36.70	30.37	35.76	36.75
2012 - 13*	10.06	10.07	10.16	33.29	30.38	33.77	36.76	30.33	35.84	36.71
Mean	10.08	10.05	10.19	33.26	30.35	33.80	36.73	30.35	35.80	36.73

* Each value of triplicate.

Table II. Crude protein (%) of bhakries prepared from different legume enriched flours

Years	Sorghum flour	Chick pea flour	Soybean flour	Control	Sorghum + Chick pea			Sorghum +Soybean		
					10	20	30	10	20	30
2011 - 12*	7.80	25.07	39.53	6.29	7.97	9.67	11.34	9.60	12.98	16.22
2012 - 13*	7.88	25.15	39.43	6.37	8.05	9.73	11.44	9.66	12.90	16.28
Mean	7.84	25.11	39.48	6.33	8.01	9.70	11.39	9.63	12.94	16.25

* Each value of triplicate

Table III. Crude fat (%) of bhakries prepared from different legume enriched flours

Years	Sorghum flour	Chick pea flour	Soybean flour	Control	Sorghum + Chick pea			Sorghum +Soybean		
					10	20	30	10	20	30
2011 - 12*	0.50	0.65	0.77	0.69	1.07	1.69	2.20	1.81	3.23	4.49
2012 - 13*	0.56	0.61	0.79	0.63	1.11	1.63	2.26	1.89	3.13	4.53
Mean	0.53	0.63	0.78	0.66	1.09	1.66	2.23	1.85	3.18	4.51

* Each value of triplicate

Table VI. Ash (%) of bhakries prepared from different legume enriched flours

Years	Sorghum flour	Chick pea flour	Soybean flour	Control	Sorghum + Chick pea			Sorghum +Soybean		
					10	20	30	10	20	30
2011 - 12*	0.32	0.39	0.41	0.34	0.60	0.93	1.27	0.65	1.09	1.40
2012 - 13*	0.28	0.33	0.33	0.38	0.66	0.99	1.31	0.71	1.03	1.48
Mean	0.30	0.36	0.37	0.36	0.63	0.96	1.29	0.68	1.06	1.44

* Each value of triplicate

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Marketing Management in Food Industry : A Case Study of Jaggery Marketing

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Abstract : Jaggery is the symbol of Indian 'Pahunchar'. The Kolhapurt is the pioneer district in Maharashtra states in manufacturing and marketing of jaggery in India. Jaggery can use for Chiramura ladu, Shira, Poli, Modak, Chikee, Aurvedic products and GIFT ITEMS. The marketing problems have observed like seasonal production, lack of branding, lack of awareness etc. These units should be rural tourist centers. Jaggery can be used for different value added products. Through jaggery business one can do "Gram Vikas" by local resources and Mahatma Gandhi's rural India will be come into existence. Jaggery should be introduced to the school going students as a "Madhayan Bhojan Yojana".

Key words: Jaggery, Pahunchar, Aurvedic, By products, Eco tourism, Gram Vikas, Madhayan Bhojan Yojana.

1.0 INTRODUCTION:

Jaggery is the symbol of Indian 'Pahunchar' (hospitality) and consumption of jaggery is the birth right of Indian people. In our Vedas and Upnishadaja, references of consumption of jaggery are found. The Maharashtra state is one of the pioneer states in manufacturing and marketing of jaggery in India and Kolhapur district too. One of the important small scale agro based industries is jaggery industry in Kolhapur and Maharashtra. This industry is helpful for employment generation through manufacturing process & marketing activities. At international level jaggery is a widely consumed & demanded product at present so; the local, national and international customers become habitual to consume jaggery.

Jaggery is the food of common man. It is used by the poor as well as the rich people from all age group. It is one of the energy foods available in low cost. It is used as an Ayuravedic Medicine with various purposes. Jaggery, also known as gur, has a mineral content of approximately 60 times that of refined white sugar. One teaspoon of jaggery contains approximately 4-5 mg calcium, 2-3 mg phosphorus, 8 mg magnesium, 48 mg potassium, 0.5 mg iron, as well as zinc, copper etc. Jaggery is light brown in color with flavor which is truly superior to white sugar.

2.0 SIGNIFICANCE OF THE STUDY:

The study has vast importance in the present scenario. Jaggery is the herbal eatable in India as well as at international level. The production and marketing of jaggery is helpful for employment generation at local, national and at international levels. At present, about 1150 jaggery manufacturing units (licensed and non licensed) are working in Kolhapur district of Maharashtra. These units has produced about 12,54,659 quintals with turnover of Rs. 350 cr. in 2013 -14 in the district. This study will help to the manufacturers, traders and consumers of the jaggery.

3.0 OBJECTIVES OF THE STUDY:

To study, jaggery marketing and find out applied and practical suggestions for jaggery marketing.1.

4.0 METHODOLOGY:

Primary and secondary data collection methods were used for this research. Stratified cluster . ample respondents have interviewed for data collection. The 110 sample respondents have covered on the basis of age, gender, financial position, habits, purchasing decision, familiar status, residential location, life style, occupation, etc. Jaggery consumers have interviewed with the help of pretested questionnaire in the selected sample area. Close-ended 30 questions were asked to jaggery consumers for data collection. Survey, observation, discussion, field visit etc. methods were used for data collection.

5.0 JAGGERY MARKETING:

Kolhapur district is known as "Dakshin Kashi" due to the famous temple of Mahalaxmi. The Mahalaxmi temple is believed to have been built over a thousand years ago during the Chalukyas rule in the 7th century A.D and represents the best Hindu architectural model of its kind. It also indicates that the city was the center of learning art and culture. Kolhapur district, at the tail end of Maharashtra state, borders on Belgaum district of Karnataka State; but geographically, it is a part of Sahyadri hill ranges.

Kolhapur district has 1150 total jaggery manufacturing working units, of which majority units are in Karveer and Shahuwadi talukas in Kolhapur district. From India about 3000 to 4000 tones of jaggery has exported to America, Canada, England, Pakistan, Saudi - Arabia, Shrilanka etc. countries out of which majority jaggery export from Kolhapur district as a "Kolhapur Gur".

The jaggery sellers in market yard, Kolhapur are working last 40-60 years in this business. Majority of the traders are from second generation who are dealing with this business. Another notable factor is found that majority of the jaggery traders are completed their 7th - 10th standard of education. It means that majority of the jaggery traders (Adatyas) are less educated. The traders are doing lakhs of rupees turnover in six days of a week. They are coming daily 9.00 a. m. to 1.00 p.m. for jaggery selling by way of auction sale. The farmers are bringing jaggery from their manufacturing centre to market yard at specific trader (Adatya) at early morning. The Adatya's are starting auction between 9.00 a.m. to 1.00 p. m. in front of 'Market Committe Members'. The jaggery sale is by auction and the highest price offering bidder is eligible to get jaggery through this auction. It is an open auction method. At present daily 40-50 jaggery purchasers are coming to purchase jaggery in Market Yard. The 80% of the jaggery purchasers are from Gujarat state. Only 20% jaggery purchasers are from local market. The majority of Gujarati purchasers are coming because in the Gujarat, 10-15 kg jaggery has been consuming per family per year i.e. 2-3 kg per person and it is a considerable volume of jaggery consumption in Gujarat state.

In India on an average 18 kg of sugar has consumed per person per year. It means that an average consumption of sugar per person per month is 1.5 kg and it is very low. In this context jaggery consumption per person per year or per month is negligible i.e. 'O' (zero). We are consuming jaggery in urban area for only traditional festival and in rural area only poor and below poverty line (BPL) persons (source by observation). Considering this situation it can be concluded that per person per year jaggery consumption is very low, that's why jaggery marketing become difficult. One more thing has observed by the researcher that the almost all jaggery producers have been consuming 2 to 3 kg jaggery per month i.e. 25 to 36 kg per year. Another point is noted here that the majority of the jaggery manufacturers and workers in the jaggery manufacturing units are consuming jaggery only (except some exceptions) (source: discussion with concern persons). Under such circumstances increasing sales of jaggery is very difficult and this is one of the obstacles in the jaggery marketing. It is suggested that government should supported and motivated the jaggery consumption and develop the jaggery consumption habit among the rural and urban area people. One should develop branded jaggery like "Mangala" brand developed by Shri Gopalrao Manaku Patil, Hiravade – Khalasa, farmer, "Shahu Gur" by Shahu Gur Kharadi – Vikari Sangh, "Natural Jaggery", by Kaneri Math, etc. which are helping for easy marketing of jaggery.

It is observed in last two years in two seasons of the jaggery marketing the price of the jaggery per kg. is between Rs. 25 to 28 in the market yard on wholesale basis and at the same time in the retail market the price of jaggery per kg. is between Rs. 50 to 70. The farmers are really doing hard work about 12 to 15 months for sugar cane plantation, development, cultivation, harvesting and jaggery production and after that they are getting very less amount of return from sale of jaggery in the market. The jaggery producers don't have any choice to sell their produced jaggery except market yard auction sale. The jaggery manufacturing is about October to April and consumption is through out year. On the basis of quality, colour, size, test, sweetness and hardness of jaggery, gradation has takes place. In market yard for selling of jaggery 7-8 shops lines are established. In these traders' shop once in a week auction has organized. In a selling process first step auction, second step is weighing, third step is billing and forth step is receiving the payment of sold jaggery. Generally 15 to 30 days credit is offered by the Adatyas to the purchasers of jaggery and at fifth step the Adatya is making payment to the farmer (jaggery producer) and it is called as the farmer got 'Patti'. In "Patti" process there is an exploitation of the jaggery manufacturers.

Jaggery can be used for prepare sweets like Gur Poli, Puran Poli, Shengadane Poli, Til Vadi, Khobara Vadi, Chirmoora Ladoo, Halava, Modak, Panha, Kheer and Sweets etc. In India, people often prepare sweets with jaggery. Particularly for naivedyam, jaggery sweets are preferred to sugar sweets. India is a full of culture and festivals....like Chaitra - Chaitra

padava, Ram-navami, Hanuman Jayanti, Vaishak- Mango, Shankaracharya Jayanti, Jest - Dan, Donation, Ashad- Ekadashi, Shravan- King of festivals, Bhaddrapada- Ganapati, Ashwin- Vijayadashami, Kartik- Diwali, Margshirsha- Datta jayanti, Pousha- Makar sankarantra, Magha- Ramadas Navami, Falgun- Holi etc. festivals cooking preparation jaggery is used as a sweet. Jaggery can be provided or served as the PRASAD of the Mahalaxmi to the devotees.

By products can be produced like bottled concentrated sugarcane juice, modak, grannuls, poweder, kakavi etc.

6.0 DATA ANALYSIS AND INTERPRETATION

Table No. 1 Shape of Jaggery

Sr. No.	Particulars	Respondents	Percentage
1	Modak	24	12
2	Square	46	24
3	Traditional Shape	90	46
4	Granules	12	6
5	Powder Form	24	12
6	Total	196	100

(One respondent gave more number of responses so, total is 196)

Table No. 1 shows that the shape of the jaggery produced. 46% of respondents are producing traditional elliptical shape, 24% of respondents producing square shape, 12% of respondents are producing modak and powder form and only 6% are producing granules shape. Majority of the sample respondents are producing traditional shape which is more convenient, easy and cost of production is less. It is studied that jaggery size and conversion into granules and powder is costly, production of modak in bulk size is not practically possible. Smaller size jaggery production increasing cost of production. One more factor is noticed by the researcher that traditional and square shape is more suitable for godowning the jaggery and other fancy shape jaggery products godowining is somewhat difficult.

Table No. 2 Production of Jaggery Syrup. (Kakvi)

Sr. No.	Particulars	Respondents	Percentage
1	Yes	30	27
2	No	80	73
3	Total	110	100

Table No. 2 shows that production of jaggery syrup (Kakvi). 73% of the sample respondents are not producing jaggery syrup and only 27% sample respondents are producing jaggery syrup. Earlier i.e. 6-7 years back no one was producing jaggery syrup for sales but at present

27% of sample respondents are producing jaggery syrup for sales i.e. commercial purpose. It indicates that jaggery syrup consumption is increasing day by day. In market, non chemical jaggery syrup is Rs.100 per kg and regular jaggery syrup is Rs.80 per kg on retail basis. The producers are packing jaggery in glass and plastic bottles. They are producing 200 ml, 500 ml and 1000 ml size bottles. Jaggery syrup is good for health, so, one has to do more research in this area.

Table No. 3 Net Profit Percentage to Sales

Sr. No.	Particulars	Frequency	Percentage
A	5 %	6	5
B	10 %	104	95
C	15 %	0	0
D	20 %	0	0
E	25 %	0	0
F	Total	110	100

Table No. 3 shows that net profit percentage in jaggery trading business. It is observed that 90% sample respondents has responded that net profit is 10% and 5% sample respondents has responded that 5% net profit. Considering the majority respondents responses the jaggery sellers are getting 10% net profit in this business and it is good. Considering Rs. 50 lakhs average turnover per selling units they are getting Rs. 5,00,000 net profit. It is necessary to study that, how much profit is getting by jaggery producers? And its answer is, they are getting very less profit percentage. In this regard more study is required.

Table No. 4 Jaggery Consumption Increased

Sr. No.	Particulars	Frequency	Percentage
A	Yes	6	5
B	No	104	95
C	Total	110	100

Table No 4 shows that jaggery consumption by the customers. As per the respondents opinion 95% Adatya respondents has stated that the jaggery consumption is not increasing and only 5% respondents has stated that jaggery consumption has increased. It indicates that jaggery consumption has not increased as per Adatya's opinion point of view. If this is the case then sales of jaggery in the market will not increase. As per the government statistics, average Indian person is consuming 18 kg of sugar directly and indirectly. In this sugar consumption jaggery consumption is included which is negligible and this jaggery consumption is very-very negligible quantity. To increase the jaggery production, jaggery consumption should be increased.

Table No. 5: Selling Place of Jaggery

Sr. No.	Particulars	Respondents	Percentage
1	At Market Yard	82	75
2	Through Retail Traders	24	21
3	Self Retailing	4	4
4	Total	110	100

Table No 5 shows that selling place of jaggery. It is observed that 75% of the jaggery manufacturers are selling their production at Market Yard, Kolhapur where daily auction sales has been conducted. 21% of the sample respondents are selling through retail trends and only 4% sample respondents are selling jaggery by doing self retailing. It shows that for selling jaggery, market yard mechanism is very important and suitable to the jaggery producers where different facilities are made available. In this study the researcher has observed that there are number of short falls in marketing of jaggery, which is discussed at appropriate place. In comparison with manufacturing and marketing there is very easy to produce jaggery but it is very difficult to market the jaggery. The basic problem of jaggery marketing is lack of organized and effective marketing set up. Jaggery is seasonal and perishable edible, so, its marketing is challenging. More study in this regard is required.

Table No. 6 Packaging of Jaggery

Sr. No.	Particulars	Respondents	Percentage
1	Gonpat / Jute Bags	12	11
2	Plastic Paper and Bags	72	66
3	Other e.g. Corrugated Box	16	14
4	No packing	10	9
5	Total	110	100

Table No. 6 shows that the types of packing for jaggery. 66% of the respondents are packing in plastic paper and plastic bags and 14% of respondents are packing in corrugated boxes. Only 11% sample respondents are packing in gonpat i.e. jute bags and 9% of jaggery producers are not packing in any packing material. This table shows that majority of the jaggery manufacturers are packing their production. It is observed that majority of the jaggery producers are selling their jaggery in Kolhapur Gur Market on wholesale bases, that's why they are not much bother about packing. Their packing expenses are more, so these manufacturers are not more interested in other sophisticated and attractive packing system. One more point is considerable here that the jaggery is having more moisture content and such a moisture content product packing is difficult. At two places the jaggery manufacturers are producing granules and jaggery powder. This granules and powder is packed in the plastic bags and plastics jars (daba's). At 2-3 places it was observed that, who are producing only one kg jaggery size output, they are using polythine paper bags and corrugated boxes for packing.

Table No. 7 Jaggery Production Size

Sr. No.	Particulars	Respondents	Percentage
1	100 gms	7	6
2	500 gms	15	13
3	1 kg	33	29
4	5 kg	15	13
5	10 kg	33	29
6	30 - 33 kg	7	6
7	As per demand	4	4
8	Total	114	100

(One respondent gave more number of responses so, 114 is total)

Table No. 7 shows that jaggery production size. It is observed that all respondents are producing different size of jaggery, not any one type of production size. 71% respondents are producing 1 to 10 kg size, 13% respondents are producing 500 gms and 5 kg size, 6% respondents are producing 100 gm and 30-33 kg size and 4% respondents are producing jaggery as per the demand of the customers. It is specially observed by the researcher that the jaggery producers are having set pattern for jaggery production. They are not changing repeatedly the pattern size of the jaggery. Almost all jaggery producers are using traditional production pattern, so, they are producing convenient standard size of production. At 2 places they are producing jaggery in square size. 1 kg., 5 kg., 10 kg., size production is found in more places.

7.0 CONCLUSION:

Considering above mentioned facts and figures the marketing strategy should be proper and innovative. The customers, young generation and doctors should attract towards the purchase and use of jaggery. Kolhapur jaggery is world famous agro based processed product. The jaggery and it's by products has Ayurvedic importance in India. Jaggery is an 'energy food' for the masses. The various products of jaggery and gift items should be introduced which have demanded and accepted by 90 percent of the sample respondents.

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International Business Operations with Reference to Cadbury Bournvita's Case

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1.0 INTRODUCTION

Due to the emergence of the concept of 'global village' by erasing the national political boundaries for the purpose of business, one cannot escape from the buying excitement derived from products like Italian Shoes, Japanese Car, Brazil Coffee, Keniyan Tea, Indian Garments, American Pizza and Chinese Toys as the entire globe is knitted through wires and satellite.

The concept of global village resulted in exchange of cultures across the globe, location of manufacturing centers in various countries by treating the entire globe as a single country, producing the product in one country and market the product in the another country. The customer by staying in his home country can buy the products from any country. Thus, the scope of international trade and international marketing is enlarged to international business.

The business across the borders of the countries had been carried on since times immemorial. But the business had been limited to the international trade until the recent past. The post-world war II period witnessed an unexpected expansion of national companies into international or multinational companies. The post 1990's period has given greater fillip to international business.

In fact the term international business was not in existence before two decades. The term international business has emerged from the term international marketing which in turn, emerged from the term 'export marketing'.

The multinational companies which were producing the product in their home countries and marketing them in various foreign countries before 1980's, started locating their plants in foreign or host countries. Later they started producing in one foreign country. For example, unilever established its subsidiary company in India, i.e. Hindustan Lever Limited (HLL). HLL produces its products in India and markets them in Bangladesh, Sri Lanka, Nepal, Etc.

International business encompasses any business transaction that involves parties from more than one country. These transactions can take various forms and can involve companies, group of companies and government agencies. International Business can differ from domestic business because of difference in currency, legal systems, cultures and resource availability. An international business is one that engages in commercial transactions with on individual's private firm, and public sector organizations that cross national boundaries.

International business has several forms

such as imports, exports, international investments such as licensing, franchising and management contracts. Among all these forms, management contract is the form which is adopted by "Cadbury's Bournvita" at its Indian plant in warna. Under this particular form of international business a firm in one country agrees to operate facilities or provide other management services to a firm in another country for an agreed upon fee.

Even though the evidence of international business activity can be traced back thousands of years, it has grown dramatically in recent years because of market expansion, resource acquisition, competitive force, technological changes, social changes and changes in government trade and investment policies.

Thus for the joint venture of "Cadbury's Bournvita", it is necessary to consider certain aspects like which firm manufactured the product? In which county is that firm based? Why it is manufactured there? What are the objectives behind this tie-up, what are the benefits for England's Bournvita as well as the strengths and weaknesses of Warna Unit of Maharashtra.

Location decisions are also of paramount importance to effective international operations management. Country related considerations include resources availability and costs, infrastructure etc. Product related issues are the Value -to-weight ratio, production technology and the importance of customer feedback. Government factors that must be considered include stability of political process, tariffs and other trade barriers and economic development issues. Finally organizational issues include the firms strategy, its structure and its inventory management policies.

At present, the Indian economy is going through a transition phase where the restructuring of industries and firms takes place in the form of privatization, globalization and liberalization after the implementation of the Structured Adjustment Programmes (SAP) in the Indian economy. With the rapid rate of the integration of Indian economy with the rest of the world and with the ongoing attempts of privatization, globalization and liberalization, the subject matter of International Business has been getting more and more acceptance even in developing countries like India.

The liberalized approach towards foreign direct investment was initiated in India in the first half of the 1990's as part of the structural adjustment programme. This is evident from the policy changes on

a] sectors open to foreign direct investment:

b] level of foreign equity participation; and

c] approval procedures.

Today, as a result of these policy reforms, India is also one among the developing countries that try to attract more foreign direct investment and attempt to increase the volume of foreign trade.

The emergence of the multinational enterprises a s a dominant institution in the world economy has resulted in the importance of understanding not only multinational enterprises themselves but also their business operations like Production, marketing, finance and the people working within these organization. The problem of cross-cultural differences also forms a major issue.

Managing & developing human resources in international setting is increasingly recognized as a central challenge particularly for MNC's face competing pressures for standardizing HRM practices with business strategy and external pressure to the localize HRM practices consistent with the host country environment. Social responsibility issues like safety, environments etc are to be faced in a innovative way so that MNC's can develop a positive image as a responsible corporate citizen.

Outsourcing is adopted by many companies to remain competitive as a way to reduce costs, increase efficiency and refocus critical resources. Outsourcing is an appropriately structured arrangement between an organization and an outsourcing supplier to perform services, which were otherwise conducted in house. It is also important that the contract be effectively negotiated and managed. Outsourcing is not an exception at international level. Researcher has selected such an international outsourcing agreement for to present paper. The outsourcing unit is Cadbury's bournvita of England and outsourcing supplier is a Warna unit of Warna complex situate in Maharashtra State of India.

The researcher has studied an outstanding example of international business i.e. Cadbury's bournvita. In 1991, Warna complex a co-operative society in Kolhapur, Maharashtra commenced producing bournvita in a unique tie-up with Cadbury, which is a MNC. The tie-up is unique in the perspective of joint venture between a co-operative society i.e. Warna and a MNC i.e. Cadbury. Also the process of operations is quite different as the parent company provides the required raw materials to the co-operative producing units which bear the total cost of processing or conversion. The co-operative unit is concerned only with the conversion of raw materials into finished products. Its revenue is generated from cost of conversion as paid by the parent company. It is not involved in marketing.

A study of this joint venture provides enriching insight into valuable modern trends in international business world. These are in the fields of new dimensions of joint ventures. As far as Cadbury Bournvita plant at Warna village is concerned, its uniqueness lies in sharing of technology by a co-operative unit, introduction of MNC ethics, norms and culture into co-operative, setting of co-operative objectives in an emerging international business i.e. production, human resource management and financial management aspects in such a unique joint venture. The lessons learnt from the study will provide future models for joint ventures between our co-operative societies with MNC's.

This will result in greater economic strength of the nation. This can be adopted as an approach for economic growth of our rural areas and ultimately rural development.

Thus the purpose of the paper is to study the opportunities, challenges as well as the problems and difficulties faced by the Indian firms in international business.

2.0 CADBURY'S CASE

Cadbury's Bournvita at Warnanagar is a joint venture two decades years old. It is named as Malted Food Manufacturing organization with a workforce of 425 dealing with products like bournvita, drinking chocolate, Coco powder and bite. Cadbury's products cater to the needs of customers of all age groups but especially the small children, so hygienic conditions are observed very strictly.

This unit came into existence as result of agreement between Cadbury India Ltd. and Warna co-operative society to produce bournvita in 1991 thereafter drinking chocolate in 1994 and bites in 2003.

The objectives behind this joint venture are:

1. Development of rural area.
2. To avail benefit of MNC's advanced technology and generation of employment to village community. Establishment of this joint venture was to reduce the cost of production.

According to agreement the Malted food Factory at Warna is to be involved in production only. The cost of production is also to be borned by Warna unit. The Cadbury India has to provide raw materials required for production and packaging. The Cadbury India has to provide cost of conversion to Warna unit at the agreed rate. This initial agreement of 1991 was concluded for 10years which was subsequently extended further with a span of 5years till today.

What prompted Warna to get in touch with MNC like Cadbury India? There are certain reasons behind this. As far as Cadburys view point is concerned; it was to avail cheap labour at Warna. But from Warna's point of view it was to acquire the latest technology of Cadbury unit.

After the agreement & commencement of operations there were certain challenges perceived by the Warna unit. The first and the most important challenge was to work under the new technology, culture and ethics. Intensive training imparted by parent company in the initial stages facilitated in overcoming this challenge. Inspite of being a co-operative unit the confidence imposed by MNC for a joint venture posed a great on the question of whether they will be able to fulfill the agreement or not. For Warna unit it was a matter of pride and a sense of great achievement to be associated with a MNC.

It is a fair blend of MNC technology and indigenous culture and philosophy of Warna which has ultimately led to the success of such a unique tie-up. This phenomenon has been

passed on to other unit of Warna complex like Warna milk dairy and tetra pack unit.

Occasionally certain infringements do occur in stipulated terms and conditions but these are settled in an amicable manner at the earliest through mutual consultation and understanding arrived after a critical analysis of a situation.

As far as production concerned, production norms and target is provided by the MNC. Warna unit has to just convert raw materials provided by MNC into the finished products. As regards finance, it is provided by Warna complex only. Warna unit has nothing to do with marketing; it is totally done by Cadbury India Ltd. itself. To handle the workforce satisfactorily sound HR policies have been adopted at this unit. Its comprehensive labour welfare policy includes various facilities such as providing milk to drink for every worker about 200ml every day. A pair of uniforms and safety shoes also provided once in a year. The preference in admission and concession in fees is given to the children of employees so that they may pursue better education. Even for recruitment, the principle followed is "Son is Soil", without violating the criteria for selection like minimum educational qualification and medical checkup. For most of the jobs, confirmation is given by following a prohibition period of 1 year. The company provides formal induction training followed by on the job training which is of one week duration. This period can be extended further if required. An objective performance appraisal system prevails in the unit, where the appraisal is done by immediate boss. As far as compensation is concerned, the employees are paid competitive wage rates.

According to the demand of Cadbury Indi, expansion and modernization was carried out in the year 2006 at the cost of Rupees 19 crores. This brought about welcome changes in enhancing production capacity in layout, cost reduction and more employment. As per the new production capacity there is daily increase in capacity in production to the extent of 40 to 45 tonnes of bournvita instead of 22 tonnes per day. Another by product of expansion programme is increased revenue.

Further benefits of expansion re 5% increase in labour cost per year. Due compensation for increase in overhead charges there is improvement in quality as total plate count came down to 6000 instead of 15000. Enhanced rate of conversion resulted in increased revenue.

Peaceful relations are between the management and labour exists as strikes and lock-outs are totally absent.

Quality assurance is the prime factor for the success of this joint venture. Quality principles are laid down by parent body in the form of a scientific quality policy disseminated to each and every employee.

3.0 QUALITY POLICY

1. Market high quality products that

consistently meet our specifications and comply with local regulatory requirement.

2. Actively listen and regularly respond to the quality expectation of our consumer at the points of purchase and consumption.
3. Ensure that representation of our company image including our trademark, meet approved standardization and reinforce our commitment to quality.
4. Encourage "a right first time culture' "for which employees appropriately trained and accountable for quality.
5. Operate a waited quality management system.
6. Assign clear management accountability for setting and meeting measurable quality targets.
7. Work with our supply chain and business partner to drive compliance to our quality policy and system.

The products of this company are mostly consumed by infants and children, so the health and hygiene is the prime consideration. To this end they conduct SWAB test to see the presence of any micro organism or bacteria on the palm of any worker.

Very stringent measures are adopted for employees as well as visitors in order to maintain quality and hygiene and to prevent any type of contamination.

Thus to a considerable extent the indigenous unit Warna is able to grab the opportunities by a giant MNC, accept the challenges by overcoming the problems and difficulties faced at the time of inception as well as from time to time.

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